

# impact

## BIOENERGY!

Idaho National Laboratory • **BIOMASS FEEDSTOCK NATIONAL USER FACILITY**

*Welcome to the first issue of BFNUF's bioenergy newsletter. As its name denotes, our goal is to make a strong 'impact' on all readers' ability to better engage in the bioenergy marketplace, as well as positively influence national bioenergy goals. In each issue, we will highlight a feedstock challenge facing the emerging bioenergy industry and provide information about the BFNUF resources available to address the challenge.*

- Kevin Kenney, INL BFNUF Director

### ISSUE 1, 2015

- What is the BFNUF?
- The Process Demonstration Unit
- Addressing Feedstock Variability
- Customer Success Story

## WHAT IS THE BFNUF?

### The Feedstock Problem

Biorefineries are emerging on the national landscape, transforming our nation's waste and biomass into clean, renewable, sustainable energy resources. Behind the glitz and glamour of technologies that turn corn stalks into automobile fuels, however, is a complex feedstock supply chain, large enough to be worthy of its own dedicated industry.

As conversion technologies transition from lab to pilot to demonstration and commercial scales, the problem of variability becomes apparent. Biorefineries that process bulk solids often operate at less than 50 percent of their design capacity in their first year. Until recently, the feedstock variability problem could only be solved with expensive redesigns and retrofits. Now, at Idaho National Laboratory (INL), biomass researchers are uniquely positioned to help

industry proactively address this problem.

### Building a Solution

When INL began operation in 1949, its focus was nuclear energy. The lab has since expanded its research to include all forms of clean and renewable energy sources. In fact, the Lab's Energy and Environment Science & Technology (EEST) Directorate, which addresses some of the nation's most pressing energy issues, leads the U.S. in biomass feedstock supply and logistics research. With years of experience in supply chain logistics and a recognized core competency in biomass preprocessing, INL was a natural choice when the Department of Energy's Office of Energy Efficiency and Renewable Energy established the Biomass Feedstock National User Facility (BFNUF). On Oct. 1, 2013, the BFNUF opened its doors to industry-led research and other academic and

government groups as a resource for solving current and future feedstock issues.

### Capabilities and Resources

The BFNUF provides access to feedstock expertise, unique testing equipment, and state-of-the-art facilities critical to the scale-up and integration of any bioenergy project. User facility resources and capabilities include:

- Supply chain analysis and design.
- Feedstock characterization for improved quality and decreased variability.
- Preprocessing designs that improve variability

and provide consistent feedstocks.

- The Process Demonstration Unit (PDU), a pilot-scale, reconfigurable biomass preprocessing system with a capacity for 2 to 5 tons per hour.

Researchers at the facility strive to engage industry, build partnerships that advance technical and operational capabilities, and ultimately strengthen U.S. competitiveness in high-tech bioenergy. The BFNUF helps new energy concepts successfully transition from the realm of scientific investigation to the marketplace. ●

THE BFNUF OFFERS WORLD-CLASS EXPERTISE IN FEEDSTOCK LOGISTICS, PREPROCESSING AND CHARACTERIZATION TO ENHANCE BIOENERGY CONVERSION AND PREPROCESSING TECHNOLOGY.

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## THE PROCESS DEMONSTRATION UNIT

The flagship of the BFNUF is the Biomass Feedstock Process Demonstration Unit (PDU), located in a 27,000-square-foot high-bay in INL's Energy Systems Laboratory. The PDU was built and is operated with funds from the Bioenergy Technologies Office within the DOE's Office of Energy Efficiency and Renewable Energy.

The PDU is a pilot-scale, fully integrated, custom-configurable feedstock processing system that produces industrial

feedstocks to customer requirements using any or all of the following procedures:

- Hammer Mill Grinding
- Rotary Drying
- Pelletizing
- Cubing

The modular design of the PDU allows the process flow to be customized to the specific needs of the project – including adding a customer's own equipment – making this a versatile system for process design, scale-up and integration. With production capacities up to 5 tons per

hour, the PDU can produce large quantities of feedstocks for material handling and conversion testing that will provide collaborators with the information needed to move forward with their projects.

Alongside the PDU, customers also have access to pilot-scale torrefaction systems, as well as a one-of-a-kind chemical pre-conversion system that can produce batch- or continuous-mode aqueous and solvent-based extractions. Our feedstock supply and

development capabilities have been used to process a wide variety of milled and densified feedstock products from agricultural residues, wood, grasses and municipal solid waste. To date, we've worked with more than a dozen biofuel, biopower and waste-to-energy technology developers and produced more than 500 tons of feedstock in support of their projects. We look forward to continuing to work together with all organizations that can make use of the PDU. ●



## COMPLEMENTING THE PDU

While the PDU focuses on conventional preprocessing services, other BFNUF laboratories provide more advanced, state-of-the-art R&D preprocessing technologies.

**Densification Laboratory:** Advanced densification process design starts here. Small-scale feedstock R&D – pounds per hour instead of tons – increases the likelihood of success when the process is scaled up.

**Torrefaction System:** Biomass is roasted in the absence of oxygen to produce biocoal, a solid biofuel that can burn with coal or replace coal completely.

**Chemical Preconversion System:** A wide variety of aqueous- and solvent-based extractions can be tested to remove inorganic contaminants from feedstocks and co-products using this versatile, scalable system.

**Bioenergy Feedstock Library:** Approximately 50,000 samples worth of data from BFNUF studies is kept in a publicly accessible database, with a corresponding physical repository onsite for many reference samples.

## CUSTOMER SUCCESS STORIES: DUPONT

What if a company could partner with world-class experts to speed the development cycle of new technologies? That's exactly the goal of the BFNUF. Researchers at the BFNUF have worked with more than a dozen companies to help address biomass and biofuel challenges so each company can take its products to the next level. A continuous feature of these newsletters will be a highlight of the experiences BFNUF researchers have had working with customers. This month: DuPont.

### DuPont Tests New Supply System Design for Cellulosic Byproducts

When DuPont wanted to evaluate various higher-value applications for its cellulosic ethanol co-products, the PDU was the natural choice for testing new processes and ironing out potential, unforeseen issues, before moving to large-scale production.

PDU researchers worked closely with DuPont representatives to optimize the layout of the equipment specifically for this new process. Then the real work began.

Large quantities of product were shipped in and out of the PDU each week, as INL scientists worked 12 hours a day and six days a week to meet a significant production goal within approximately 10 weeks. All so a potential DuPont customer could run a trial, consuming everything in just two days.

The PDU naturally hit a few slowdowns as it encountered unforeseen problems that plague any new endeavor. In general, most issues were associated with matching equipment capability with the new material. As each new challenge arose, DuPont and the PDU staff worked together as a team to solve it.

By testing its concept at the PDU, DuPont was able to access some of the best researchers in the field to help figure out how to address potential issues for a new co-product before taking on the costs of a full-scale production

attempt itself. "We greatly appreciate the support and expertise of the INL team," said David Wood, DuPont's cellulosic ethanol program manager. "INL's facility offered a unique opportunity to scale up some portions of our process to enable key learnings." ●

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HOURS OF PDU  
OPERATION FOR  
DUPONT

INTERESTED IN LEARNING HOW THE BFNUF CAN HELP YOUR BUSINESS? CONTACT KEVIN KENNEY FOR MORE INFORMATION.

FOR MORE INFORMATION

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SOLVING TODAY'S FEEDSTOCK  
CHALLENGES, ENGAGING  
INDUSTRY IN SOLUTIONS  
FOR TOMORROW

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